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FOOD OF THE INDIAN MACKEREL, RASTRELLIGER KANAGURTA IN THE ARABIAN SEA OFF ARTHUNKAL, SOUTH WEST COAST OF INDIA

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ABSTRACT

Analysis of gut content is commonly used to determine the food and feeding habit of fish species. The Indian mackerel (*Rastrelliger kanagurta*) is a common edible pelagic fish found along the Coast of Arthunkal in Kerala, South West Coast of India. Analysis of the stomach contents revealed that the diet mainly consisted of planktonic crustaceans. Copepods formed the predominant food being eaten throughout the period of study including copepod eggs and nauplii. The other preferred food items were *Lucifer,* zoea, megalopa, mysis, fish larvae, amphipods and Pelagic Tunicates. Phytoplankton was represented by diatoms and dinophytes. Among the diatoms, *Coscinodiscus* were the most dominant form; while *Peridinium* and *Ceratium* were found to be the commonest dinophytes. Due to the low energy content of small sized phytoplankton, it is apparent that the fish tends to put on the loss by feeding on macroplankton and fish juvenile. The study thus infers that even with global warming, mackerel has the capacity to substitute food with high energy value and modify its feeding habit depending on the availability of different organisms in the environment. In the present study, a high percentage of zooplankton is observed indicating high loads of organic contents in the environment.

KEYWORDS: *Rastrelliger kanagurta*, Feeding Behavior, Planktons

Planktons provide a crucial source of food to many large aquatic organisms, such as fish and whales. Phytoplankton is the food source for small, free-swimming crustaceans or fish larvae, referred to as zooplankton which in turn, is food for small fish and other organisms.

The nutrient quality of the phytoplankton is also important. In large, structurally complex food webs there must be the adequate quality of food in sufficient quantities. In an ecosystem with "good" quality phytoplankton, the food web is generally less complex, a "healthy" system supports larger and more diverse fish populations.

The amount of fish that can exist in a given region is primarily determined by the activity and amount of primary producers; greater primary production can support larger fish stocks. The simple model of a food web in which smaller organisms are eaten by larger ones, however, is not sufficient for explaining the relationships in the ocean.

The study of the feeding habits of fish and other animals based upon analysis of stomach content has become a standard practice (Hyslop 1980). A food habit study might be conducted to determine the most frequently consumed prey or to determine the relative importance of different food types to fish nutrition and to quantify the consumption rate of individual prey types.The Indian mackerel, *Rastrelliger kanagurta*(Cuvier, 1817) has special significance in the economy of the trophic, where the species is considered an important source of inexpensive protein and is also commonly used as bait.

Zacharia (2011) studied the trophodynamics and methods for stomach content analysis of fishes and reported that for a better understanding of diet data and for accurate interpretation of fish feeding patterns, time of day, sampling location, prey availability and even the type of collecting gear used, need to be considered before initiating a diet study.

As food intake is the major factor controlling fish production, studies of food intake and growth of the various species is expected to yield valuable information for assessing the role of the particular species in the marine food web, predator-prey interactions and production efficiency which can be usefully employed in developing EBFM models (Walters *et al.*, 1997).

Studying feeding habit of fishes does have great importance both in fisheries and aquaculture. Taking into consideration the fisheries and the role of fish in the food web, assessing the fishery potential along the coast of Arthunkal in Kerala, assumes much significance. The present study aims to generate a base line data for the feeding habits of mackerel in the Arthunkal coast since it plays a major role in fisheries and food web in the marine ecosystem.

MATERIALS AND METHODS

Study Site:Arthunkal coast (9˚39'19" N; 76˚17'23"E) Arthunkal is one of the important pilgrimage sites located about 8 km West of Cherthala and 22km North of Alapuzha, Kerala, India. The coast lies on the

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west of the village and is stretching from North to South forming a part of the Arabian Sea.

Sampling Protocol

Sampling of 240 individual Indian mackerel *Rastrelliger kanagurta* fishes ranging in size from 8 cm to 20 cm of Total Length (TL), sampled from purse seiner, once in every month, during the period May 2016-April 2017 was carried out. The specimens were preserved in ice during transit to the laboratory.

Laboratory Analysis

The morphometric measurements of each individual sample were taken before dissection: Length measurements were made to the nearest centimeter while the weight measurement to the nearest gram. The fish samples were dissected and the stomach contents removed and the weight of the stomach content was measured. The points system (Hynes, 1950) was used for analyzing the gut content. Here, each food category is awarded points proportional to its estimated contribution to stomach volume. The stomach contents were preserved in 4% formalin solution for further analysis. The stomach contents were placed in petri dishes and sorted into different groups of food items. For each stomach, the preserved individuals in each prey taxon were recorded. Identification of prey was done by using a microscope. Photomicrographs were taken. Sedgewick-Rafter counting chamber cell were used for estimating the numerical abundance.

RESULTS

Rastrelliger kanagurta [**Cuvier**, 1816]

Scientific classification

Kingdom : Animalia

Phylum : Chordata

Class : Actinopterygii

Order : Perciformes

Family : Scombridae

Genus : *Rastrelliger*

Species : *kanagurta*

FOOD CONSTITUENTS IN THE GUT OF *R. kanagurta*

Most of the food items were present throughout the seasons with copepods and diatoms most commonly observed in the stomachs examined in all the seasons. Fluctuations in food items in the gut of mackerel is given in table1and figure 1.

Copepods formed the predominant food being eaten throughout the period of study including copepod eggs and nauplii, especially during post-monsoon and monsoon. The other preferred food items were *Lucifer,* zoea, megalopa, mysis, fish larvae, amphipods and pelagic tunicates. Percentage composition of planktons in the gut content of *R. kanagurta* is shown in figure 2.

Phytoplankton was represented by diatoms and dinophytes. Among the diatoms, *Coscinodiscus* were the most dominant form; while *Peridinium* and *Ceratium* were found to be the commonest dinophytes. From December to February, *Ceratium* was abundant. Cladocerans were observed in the stomachs during the month of September. Polychaete larvae were found abundantly in the gut during monsoon.

The volumetric analysis of the food contents of mackerel shows that copepods are the dominant species. From this study, it is evident that copepods occupied 41% of the stomach content of the fish. Other major planktons which constitute the mackerel's food are *Peridinium spp.*(15%), *Ceratium spp.* (10%), *Evadne spp*. (6%), Mysis (4%), Megalopa (4%) and rest of the organisms constitute 2% each.

Table1: Fluctuations in food items in the gut of mackerel

Taxa	PRM	MON	PSM
Phytoplanktons			
Nitzschia spp.	*	**	*
Thallassiothrix spp.	*		*
Fragilaria spp.	-	*	-
Chaetoceros spp.	*	**	*
Peridinium spp	*	**	*
Ceratium spp	**	*	*
Coscinodiscus spp.	*	*	*
Zooplanktons			
Copepods	*	**	**
Lucifer spp.	*	*	*
Evadne spp.	*	**	*
Mysis	-	*	-
Megalopa	-	-	*
Oikopluera spp.	*	*	-
Polychaete larvae	-	*	-
Others	*	*	*

"**=abundant" "*=present" "- = absent"

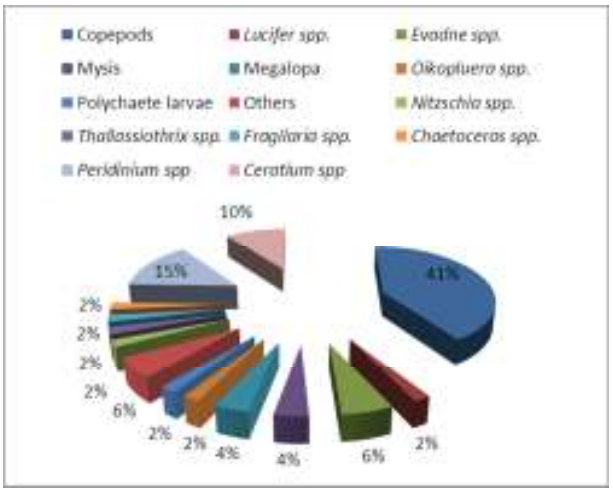


Figure 2: Percentage composition of planktons in the gut content of *R. kanagurta*

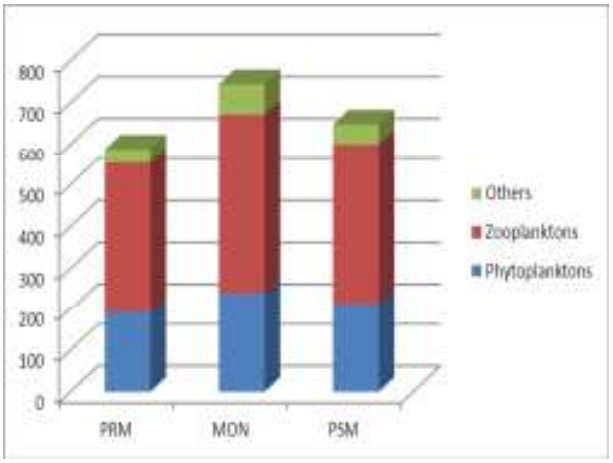
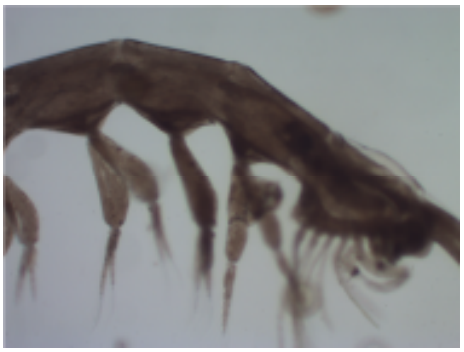


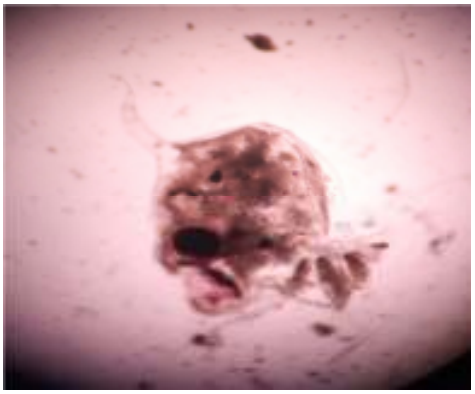
Figure 3: Seasonal variation of planktons in the gut content of mackerel

Plate 1: Planktons in the gut contents of *R. kanagurta*

Ceratium spp.



Lucifer spp.



Zoea larvae of Crab

Copepod

DISCUSSION

Analysis of gut content of fish species is widely accustomed to ascertain their food and feeding habit. Diets of fishes signify an integration of various vital ecological elements that included behavior, condition, habitat use, energy intake and inter/intra specific interactions.

Gut content analysis of *R. kanagurta* from Arthunkal coast in Kerala was studied for the first time during this investigation. Copepods formed the predominant food being eaten throughout the period of study. Accurate description of diets and feeding habits provided the basis for understanding the trophic

interactions in aquatic food webs. The present study has been carried out to get a baseline data on the feeding behavior of the Indian mackerel along the Southwest coast of India.

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